

TWO NEW SPECIES OF *CULICOIDES* OF THE *PILIFERUS*
GROUP (DIPTERA: CERATOPOGONIDAE) FROM
THE EASTERN UNITED STATES¹

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Abstract.—Two new species of *Culicoides* of the *piliferus* group are described and illustrated from specimens collected in Alabama and Maryland. *Culicoides chewaclae* is described from the female only, while *Culicoides kirbyi* is described from both sexes.

The *piliferus* group of the genus *Culicoides* Latreille is represented in North America by a complex of small to medium-sized biting midges. Wirth and Hubert (1962) reviewed the *piliferus* group species in eastern North America, describing eight new species, most from what had previously been known as *Culicoides piliferus* Root and Hoffman. Further additions by Jamnback (1965) and Wirth and Blanton (1971, 1974) brought the number of known species in eastern North America to 12. Five species of the *piliferus* group are known from the western United States (Atchley and Wirth, 1975).

The wing pattern of members of the *piliferus* group is variable, often with distinct pale spots straddling the midportion of veins M1 and M2, and along the wing margin at the apices of the cells; or the pattern may be reduced, with the pale spots entirely absent except for those over the r-m crossvein and just distad of the 2nd radial cell. The female antennal sensory pattern is also variable, usually with sensilla coeloconica on flagellar segments 3, 5, 7, 9, and 11-15; some of the sensilla coeloconica on the proximal segments, including segment 11, may be absent, or they may be present on segment 10. The spermathecae are ovoid, subequal to unequal, and usually without sclerotized necks. The male genitalia are remarkably similar and of little value in the separation of species; identification of males is best accomplished by rearings from which associated females can be accurately determined.

During a study of the Ceratopogonidae of Alabama, females of two previously

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undescribed species of the *piliferus* group were taken in light traps in east-central Alabama. Both species have also been collected in Maryland.

The descriptions are based on specimens slide-mounted in balsam or Hoyer's medium; measurements were obtained with the aid of an ocular micrometer in the eyepiece of a Zeiss phase-contrast microscope. Wing length is measured from the basal arculus to the wing tip; the costal ratio is obtained by dividing the length of the costa by the wing length. Antennal ratio (A.R.) is determined by the combined lengths of the five distal flagellar segments divided by the combined lengths of the preceding eight. Proportions given for flagellar segments refer to relative lengths and are not absolute measurements. The proboscis to head ratio (P/H) is obtained by dividing the length from the tormae to the end of the labrum-epipharynx by the distance from the tormae to the interocular setal base. The palpal ratio (P.R.) is obtained by dividing the length of the third palpal segment by its greatest width. Variation is given by the mean, followed by the minimum-maximum values and sample size. Line drawings were made with the aid of a Leitz drawing tube attached to a Leitz Dialux 20 phase-contrast microscope. The wing photographs were taken with a Nikon M35S camera attached to a Zeiss phase-contrast microscope.

Types are deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM); paratypes will be deposited in the USNM and the Auburn University Entomological Museum (AUA).

Culicoides chewaclae Glick and Mullen, NEW SPECIES

Figs. 1, 3a

Diagnosis.—A small, pale brownish species, most similar to *Culicoides alexanderi* Wirth and Hubert and *C. parapiliferus* Wirth and Blanton. Wing pale brownish, with well-defined pale spots over r-m crossvein and on anterior margin just distad of cell M4 and anal cell, other pale markings usually poorly defined. Female distal flagellar segments moderately elongated, proximal segments short; long sensilla chaetica (verticils) on segments 3–10 and 13–15; antennal sensory pattern 3, 5, 7, 9, 13–15; proboscis very short; 3rd palpal segment short and moderately swollen with a shallow sensory pit.

Female.—Wing length 0.95 (0.90–0.98) mm ($n = 3$).

Head: Brown. Eyes (Fig. 1c) narrowly separated by distance ca. $\frac{1}{2}$ width of one ocular facet; bare. Antenna (Fig. 1a) with flagellar lengths in proportion of 16-9-10-10-11-11-11-11-19-19-24-27-34; A.R. 1.36 (1.31–1.44, $n = 4$); very long sensilla chaetica (verticils) on segments 3–10 and 13–15; sensilla coeloconica on segments 3, 5, 7, 9, 13–15, sometimes also on 11. Third palpal segment (Fig. 1b) short and moderately swollen with a moderately large, shallow, rounded, distal sensory pit; P.R. 2.12 (2.05–2.20, $n = 4$). Proboscis very short, P/H 0.58 (0.56–0.61, $n = 4$); mandible (Fig. 1d) with 14 teeth (13–15, $n = 4$).

Thorax: Brown. Legs (Fig. 1e) brown, knees dark brown; fore- and midfemora each with a very faint subapical pale band; tibiae each with a faint subbasal pale band; hindtibial comb (Fig. 1f) with 4 spines, the 2nd from the spur longest. Halter infuscated very pale brown.

Wing (Fig. 3a): Macrotrichia abundant over most of wing, sparse at base of cell M2 and base of anal cell. Wing infuscated pale brown, with a well-defined pale

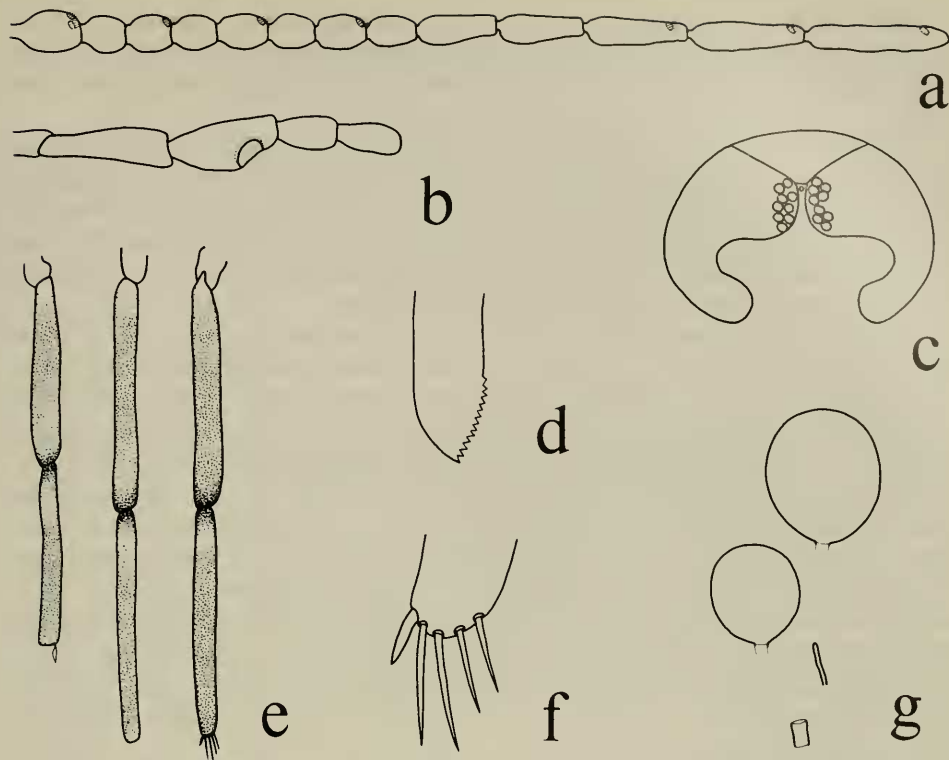


Fig. 1. *Culicoides chewaclae* female. a, Antenna, segments 3-15. b, Palpus. c, Eye separation. d, Mandible. e, Femora and tibiae of (left to right) fore-, mid-, and hindlegs. f, Hindtibial comb. g, Spermathecae.

spot over r-m crossvein and a pale spot on anterior margin just distad of 2nd radial cell; distal portion of cell M4 and anal cell each with a less prominent pale spot; a small pale spot just above cubital fork; apex of cells R5, M1, and M2 each with a faint pale spot; midportion of veins M1 and M2 each with an elongate pale spot; costal ratio 0.61 (0.60-0.61, $n = 3$).

Abdomen: Brown. Spermathecae (Fig. 1g) unequal, ovoid, without sclerotized necks; rudimentary 3rd spermatheca long and narrow; sclerotized ring moderately long; spermathecae measuring 0.053×0.045 and 0.040×0.034 mm.

Male.—Unknown.

Distribution.—Alabama, Maryland.

Types.—Holotype ♀, Alabama: Lee Co., Chewacla State Park, near Chewacla Pond, J. I. Glick, light trap, 28-30 April 1977 (USNM type no. 100683). Paratypes, 5 ♀, as follows: same data as holotype, 2 ♀; same data, 6 May 1978, 1 ♀. Maryland: Montgomery Co., Colesville, W. W. Wirth, light trap, 21 June 1975, 1 ♀; same data, 22 July 1975, 1 ♀, (Holotype and 2 paratypes in USNM; 3 paratypes in AUA.)

Bionomics.—The immature stages and larval habitat of *Culicoides chewaclae* are unknown.

Culicoides chewaclae appears to be an early spring species in Alabama, where adults were collected by light trap only during the last week of April and the first week of May. In Maryland, *C. chewaclae* was collected by light trap in June and July.

The feeding habits of *C. chewaclae* are unknown. Jamnback (1965) correlated the primary host preference of many species of *Culicoides* with the number of flagellar segments having sensilla coeloconica, with the primarily ornithophilic species having more olfactory pits than those that show a preference for large mammals. On this basis, *C. chewaclae*, having sensilla coeloconica on 7–8 flagellar segments, may be primarily an ornithophilic species.

Discussion.—*Culicoides chewaclae* is one of the smaller members of the *piliferus* group. The wing pattern is reduced and bears some resemblance to that of *C. parapiliferus*, however *C. chewaclae* is paler brown in body and leg coloration, with longer distal flagellar segments, sensilla coeloconica usually lacking on segment 11, narrower eye separation, shorter third palpal segment, and a very short proboscis. *Culicoides alexanderi* is the only other species of the *piliferus* group from Alabama and Maryland with a wing pattern in combination with an antennal sensory pattern of 3, 5, 7, 9, 13–15, but is a larger species with a more prominent wing pattern, shorter distal flagellar segments, longer third palpal segment, and a somewhat longer proboscis. *Culicoides chewaclae* and *C. jamnbacki* Wirth and Hubert are the only members of the *piliferus* group known to have long verticils on the flagellar segments, however, *C. jamnbacki* lacks the prominent wing pattern, with faint pale spots present only over the r-m crossvein and just distad of the second radial cell.

Culicoides chewaclae derives its name from Chewacla State Park, Lee Co., Alabama, which has been a major source of *Culicoides* material during the course of our survey of the Ceratopogonidae of Alabama.

Culicoides kirbyi Glick and Mullen, NEW SPECIES

Figs. 2, 3b

Diagnosis.—A small, dark-brownish species of the *piliferus* group, most similar to *Culicoides testudinalis* Wirth and Hubert. Wing brownish with a small, faint pale spot over r-m crossvein, and a small pale spot on anterior margin just distad of 2nd radial cell. Female distal flagellar segments moderately elongated, proximal segments short; flagellar segments with short sensilla chaetica (verticils); antennal sensory pattern 3, 5, 7, 9, 11, 13–15; proboscis short; 3rd palpal segment short and greatly swollen, with a moderately shallow sensory pit. Male genitalia similar to other members of the *piliferus* group; ventral membrane of 9th sternum sparsely spiculate near lateral margins; median distal process of aedeagus moderately stout with truncate apex; apex of paramere with ca. 6 lateral fringing spines.

Female.—Wing length 0.90 (0.83–0.94) mm ($n = 8$).

Head: Brown. Eyes (Fig. 2d) moderately to broadly separated by a distance of slightly less than width of $1\frac{1}{2}$ ocular facets; bare. Antenna (Fig. 2a) with flagellar lengths in proportion of 17-9-10-10-10-10-11-11-20-20-23-24-34; A.R. 1.31 (1.20–1.41, $n = 8$); segments with short sensilla chaetica (verticils); sensilla coeloconica on segments 3, 5, 7, 9, 11, 13–15, occasionally absent from 11. Third palpal segment (Fig. 2b) short and greatly swollen with a large, moderately shallow,

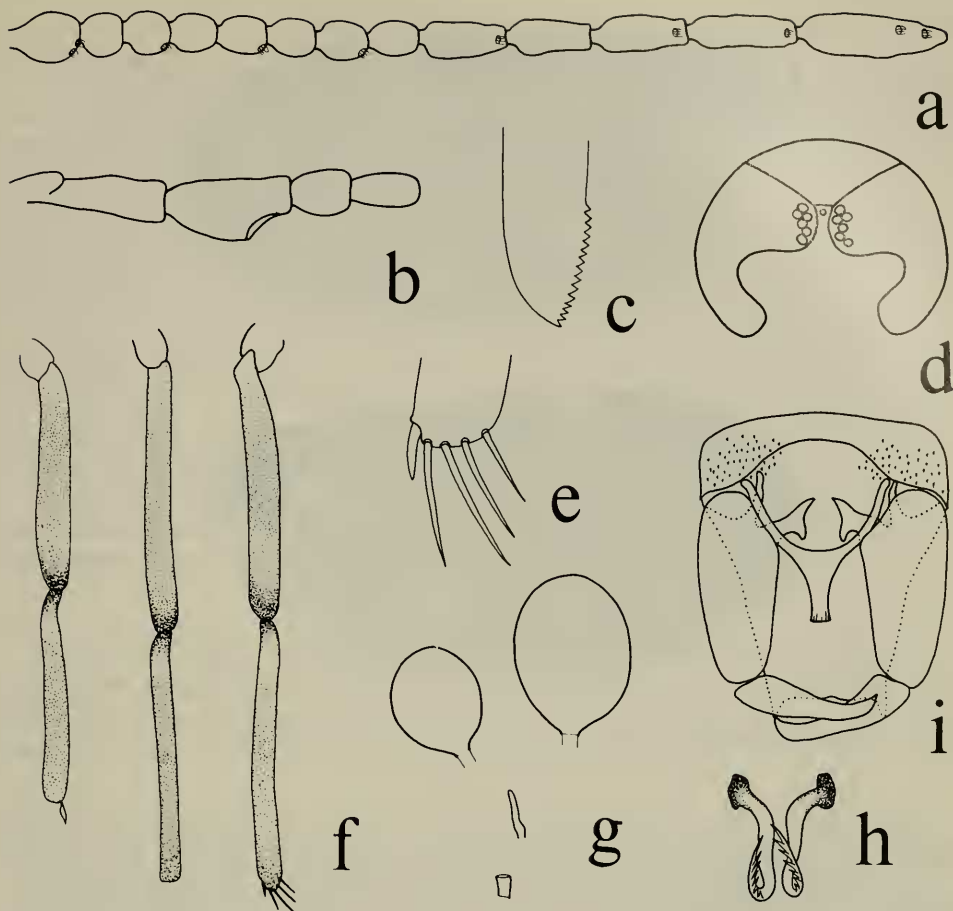


Fig. 2. *Culicoides kirbyi*. a-g, Female, h, i, Male. a, Antenna, segments 3-15. b, Palpus. c, Mandible. d, Eye separation. e, Hindtibial comb. f, Femora and tibiae of (left to right) fore-, mid-, and hindlegs. g, Spermathecae. h, Parameres. i, Genitalia, parameres removed.

rounded, distal sensory pit; P.R. 1.83 (1.72-1.95, $n = 8$). Proboscis short, P/H 0.65 (0.60-0.67, $n = 8$); mandible (Fig. 2c) with 14 teeth (13-15, $n = 8$).

Thorax: Dark brown. Legs (Fig. 2f) brown, knees dark brown; forefemur with a faint subapical pale band; tibiae each with a subbasal pale band; hindtibial comb (Fig. 2e) with 4 spines, the 2nd from the spur longest. Halter infuscated brownish.

Wing (Fig. 3b): Macrotrichia long and abundant over entire wing except at base of cell M2 and base of anal cell. Wing infuscated brownish, with a small, faint pale spot over r-m crossvein and a small pale spot on anterior margin just distad of 2nd radial cell; occasionally distal portion of cell M4 and anal cell each with a very faint pale spot; costal ratio 0.57 (0.55-0.58, $n = 8$).

Abdomen: Dark brown. Spermathecae (Fig. 2g) unequal, ovoid, without sclerotized necks; rudimentary 3rd spermatheca long and narrow; sclerotized ring moderately short; spermathecae measuring 0.056×0.040 and 0.038×0.032 mm.

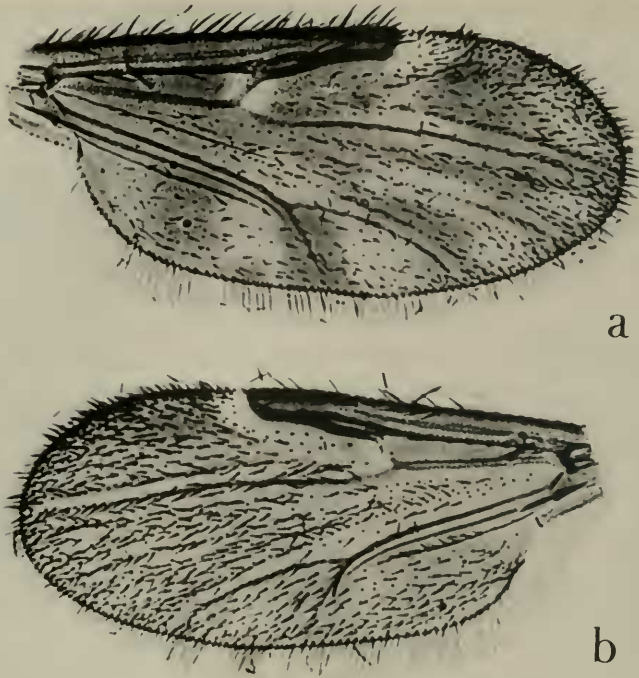


Fig. 3. a, *Culicoides chewaclae* female wing, b, *Culicoides kirbyi* female wing.

Male Genitalia (Fig. 2i). Ninth sternum with a broad, moderately deep caudomedian emargination; the ventral membrane sparsely spiculate near lateral margins. Ninth tergum with tapering sides and moderately long, slender apico-lateral processes; caudal margin not cleft. Basistyle with ventral root foot-shaped, dorsal root long and moderately slender; dististyle curved, apex bluntly pointed. Aedeagus with a deep, rounded basal arch; arms slender; median distal process moderately stout with truncate apex. Paramere (Fig. 2h) with strong basal knob; stem moderately slender and sinuate, tapering distally, ventrally recurved to a slender, pointed apex with ca. 6 lateral fringing spines.

Distribution.—Alabama, Maryland.

Types.—Holotype ♀, allotype ♂, Maryland: Prince Georges Co., Patuxent Wildlife Refuge, swamp, W. W. Wirth, Malaise trap, 16 May 1979 (USNM type no. 100684). Paratypes, 47 ♀, 17 ♂, as follows: same data as holotype and allotype, 17 May 1978, 1 ♀; same data, 27 May 1978, 5 ♀; same data, 31 May 1978, 15 ♀; same data, 12 May 1979, 2 ♀, 2 ♂; same data, 16 May 1979, 7 ♀, 9 ♂; same data, 19 May 1979, 1 ♂; same data, 23 May 1979, 5 ♀, 5 ♂; same data, 30 May 1979, 4 ♀. Alabama: Lee Co., Chewacla State Park, near Chewacla Pond, J. I. Glick, light trap, 20–21 April 1977, 2 ♀; same data, 28–30 April 1977, 1 ♀; same data, 5 May 1977, 1 ♀; same data, 26–30 April 1978, 2 ♀; same data, 6 May 1978, 1 ♀; Loachapoka, Loachapoka Hunt Club, J. I. Glick and B. Buxton, light trap, 27 April 1977, 1 ♀. (Holotype, allotype, 39 ♀ and 13 ♂ paratypes in USNM; 8 ♀ and 4 ♂ paratypes in AUA).

Bionomics.—The immature stages and larval habitat of *Culicoides kirbyi* are unknown.

Culicoides kirbyi appears in the early spring along with *C. chewaclae*. Adults were collected by light trap in east-central Alabama during the last week of April and the first week of May. In Maryland, *C. kirbyi* was common in Malaise trap collections at Patuxent Wildlife Refuge during May.

The feeding habits of *C. kirbyi* are unknown, however the high number of flagellar segments with sensilla coeloconica (8) indicates it may be primarily an ornithophilic species, as are many other members of the *piliferus* group.

Discussion.—*Culicoides kirbyi* differs from *C. chewaclae* in the greater number of antennal sensilla coeloconica, more swollen third palpal segment, broader eye separation, and darker wing with usually only two pale spots present. *Culicoides kirbyi* is similar to *C. testudinalis*, but the latter species is larger and darker, with a longer proboscis and third palpal segment, greater number of mandibular teeth, and usually fewer antennal sensilla coeloconica.

We are pleased to name this species in honor of Dr. Kirby L. Hays, Head of the Department of Zoology-Entomology, Auburn University, for his numerous contributions to medical entomology in Alabama.

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